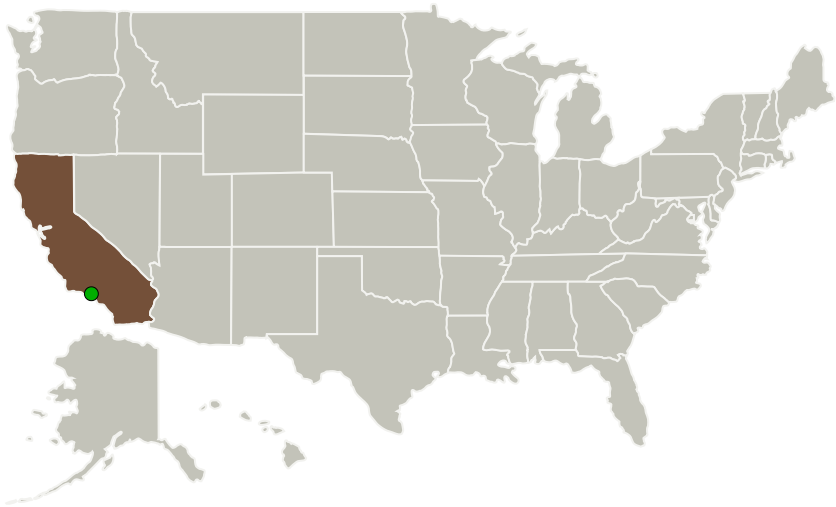
Distributed Control Architectures for Precision Spacecraft Formations, Phase I

Completed Technology Project (2010 - 2010)

Project Introduction

LaunchPoint Technologies, Inc. (LaunchPoint) proposes to develop synthesis methods and design architectures for distributed control systems in precision spacecraft formations. Implementation of precision spacecraft formations requires distribution of sensing, communication, and actuation capabilities between the spacecraft composing formation. Distributed architecture demands that each spacecraft maintains an estimate of states of other members of the formation for mission coordination, reconfiguration, and collision avoidance. We propose to design distributed estimation architectures that are able to provide a formation control system with reliable formation state estimates and monitor the formation components for faults and failures. LaunchPoint will extend the existing state-of-the-art techniques and tailor them to the specific NASA needs. The proposed design methods will provide the distributed estimators with a well-defined level of accuracy and guarantee stability of the complete distributed closed-loop system. Communication constraints and uncertainties for inter-spacecraft communication links will be explicitly considered and the developed design methods will allow trade-off between communication complexity and the formation performance. The developed methods will be applied for design of the distributed system for one of the NASA missions. The designed estimator will be tested in simulations for the practical mission scenarios and with the presence of realistic disturbances, communication, and sensor noises.

Primary U.S. Work Locations and Key Partners



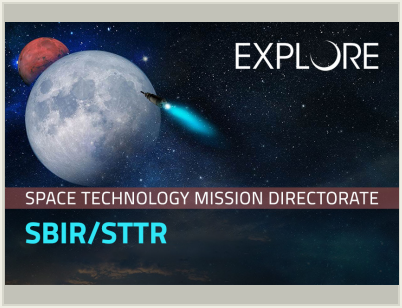


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Table of Contents

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
LaunchPoint Technologies, Inc.	Lead Organization	Industry	Goleta, California
Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California

Primary U.S. Work Locations
California

Project Transitions

January 2010: Project Start

July 2010: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/138942)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

LaunchPoint Technologies, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

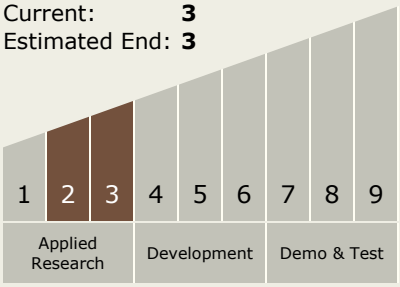
Carlos Torrez

Principal Investigator:

Maksim Subbotin

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.2 Observatories
    - TX08.2.3 Distributed Aperture

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System